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OPERATING EXPERIENCE WEEKLY SUMMARY

Office of Nuclear and Facility Safety

August 7 - August 13, 1998

Summary 98-32

Operating Experience Weekly Summary 98-32

August 7 through August 13, 1998

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EVENTS

1. CONTAMINATED LIQUID LEAKS FROM DEACTIVATED PIPING VALVE FLANGE

On August 5, 1998, at the Hanford Site REDOX facility, a radiological control technician identified a leaking flange on a deactivated plutonium nitrate solution transfer line. He found the leak while investigating a dark-colored spot on some plastic covering a piece of equipment. The technician determined that the spot was radiologically contaminated in excess of 1,000,000 dpm, alpha. While he took the reading, another spot appeared in the same place, and the technician determined that the drops were coming from a flange on an overhead valve for a deactivated piping system. The radiation control technician determined that the solution dripping from the valve flange was in excess of the radiological work permit safe operating limit and ordered all personnel to leave the facility. There were no personnel injuries or threats to the environment. However, the leak resulted in the loss of control of radioactive materials and created the potential for the spread of contamination and personnel uptakes. (ORPS Report RL--BHI-DND-1998-0008)

Investigators determined that the valve was on a section of piping that had been used to transfer plutonium nitrate solutions. They determined that workers flushed and drained the process lines during system deactivation in 1967. They also determined that decontamination and decommissioning workers discovered contaminated moisture coming from the same valve in 1996. In the 1996 event, investigators determined that significant quantities of plutonium nitrate solutions probably remained in low points of the process piping after deactivation workers completed their work in 1967. They also determined that it was not necessary to develop and implement corrective actions to flush and drain any remaining plutonium nitrate solutions because they believed that the materials were adequately contained and were not a criticality concern. Investigators now believe that deactivation workers never flushed and drained this line; they only drained and sealed it. Facility managers are developing plans to decontaminate the area, contain the plutonium nitrate solution, and characterize the amount and locations of solutions remaining in process piping.

NFS has reported similar events involving deactivated facilities in several Weekly Summaries. Following are some examples.

- Weekly Summary 98-31 reported that during decontamination and decommissioning, operations workers at the Oak Ridge Operations East Tennessee Technology Park discovered that the lube-oil system in a shut-down gaseous diffusion plant contained approximately 3,400 gallons of oil. Investigators determined that decontamination and decommissioning contractor personnel believed the lube-oil system contained only residual amounts of oil. They determined that the previous contracting organization reported that workers drained the system as part of deactivation. (ORPS Report ORO--BNFL-K33-1998-0003)

- Weekly Summary 98-11 reported that two maintenance workers at the Oak Ridge Y-12 Site were removing abandoned piping when liquid lithium hydroxide unexpectedly sprayed them. Investigators determined that the maintenance workers sawed the pipe at a low point, causing approximately 3 gallons of lithium hydroxide to spill. Investigators believe that the lithium hydroxide had solidified at each end of the low point, allowing the solution in the center to remain liquid. (ORPS Report ORO--LMES-Y12SITE-1998-0012)

These events illustrate the importance of ensuring that all deactivation work has been completed before long-term surveillance and maintenance or decontamination and decommissioning work begins. To safely accomplish this, deactivation personnel should ensure that the systems have been drained and flushed completely. When working on or near systems or components that have not been used for years, past facility operations and missions should not be solely relied on because available documentation of the system status and usage may not be complete and many materials can become unstable or unsafe over time. These events are also important because of the increasing number of DOE facilities that are transitioning to long-term surveillance and maintenance and decontamination and decommissioning activities. Managers at DOE facilities undergoing deactivation need to ensure that workers understand the scope of work. This can be accomplished by (1) clearly defining the scope of the work and accurately identifying the equipment, (2) conducting walk-downs of the work, (3) marking or tagging affected equipment, and (4) checking the work performed against a list. Work controls are important during deactivation, surveillance and maintenance, and decontamination and decommissioning because the workforce is usually not familiar with plant structures, systems, and components. Deactivation, surveillance and maintenance, and decontamination and decommissioning work planners should consult the following references.

- DOE O 5480.23, *Nuclear Safety Analysis Reports,* states that it is DOE policy that nuclear facilities and operations be analyzed to (1) identify all hazards and potential accidents associated with the facility and the process systems, components, equipment, or structures; and (2) establish design and operational means to mitigate these hazards and potential accidents. The results of these analyses are to be documented in safety analysis reports. This Order also requires periodic review and updates of safety analysis reports to ensure that information is current and remains applicable.

- DOE-STD-1073-Pt.1, *Guide for Operational Configuration Management Program*, section 1.4.2.3, states that managers of facilities in a deactivation mode should track changes and provide documentation of the structures, systems, and components that remain in the facility. Limited walk-downs of the facility should be conducted to confirm that the configuration shown on the associated documentation is accurate. Physical changes should be identified and documented.

- DOE/EM-0142P, *Decommissioning Handbook*, DOE Office of Environmental Management, March 1994, is primarily a decommissioning technology identification document and refers the reader to many important elements of decommissioning projects.

- DOE/EM-0246, *Decommissioning Resource Manual,* DOE Office of Environmental Management, August 1995, provides another reference resource for decommissioning projects.

KEYWORDS: deactivation, decontamination and decommissioning, surveillance and maintenance, radiation protection

FUNCTIONAL AREAS: Decontamination and Decommissioning, Radiation Protection, Surveillance

2. INADVERTENT TRANSFER OF MACHINE COOLANT CONTAINING FISSILE MATERIALS

On July 27, 1998, at the Oak Ridge Y-12 Uranium Conversion, Processing, and Handling Facility, a partially open supply valve allowed approximately 120 gallons of machine coolant containing fissile materials to transfer to a roughing filter house in the basement of the facility. A machine operator actuated a manual spray nozzle on a machine coolant system and noticed that coolant flow appeared immediately, even though he had not yet opened the supply valve to the nozzle. Shortly thereafter, he observed loss of all coolant flow and reported the condition to the shift manager. The shift manager ordered personnel evacuated from the area and limited access to the facility until criticality safety personnel had determined that a criticality safety concern did not exist. The inadvertent transfer relocated fissile materials from a controlled geometry to an uncontrolled geometry. (ORPS Report ORO--LMES-Y12NUCLEAR-1998-0060)

Investigators reported that a machine coolant system supplies water-based coolant containing borax to several facility machines to remove heat generated during uranium metal forming (Figure 2-1). At each machine, a branch line from a main supply line directs machine coolant through a normally closed, lever-actuated ball valve when it is needed to quench excessive heat or fire in either a room exhaust line or a chip tray. A third connection supplies a hand-held, normally closed spray nozzle. A process exhaust system draws machine room air directly over the work piece to minimize the spread of contaminants. The exhaust duct rises approximately 3 feet, runs horizontally, and drops vertically to the roughing filter house, which is maintained at low pressure by exhaust fans. The machine coolant connection penetrates the exhaust duct above a demister and a normally open damper.

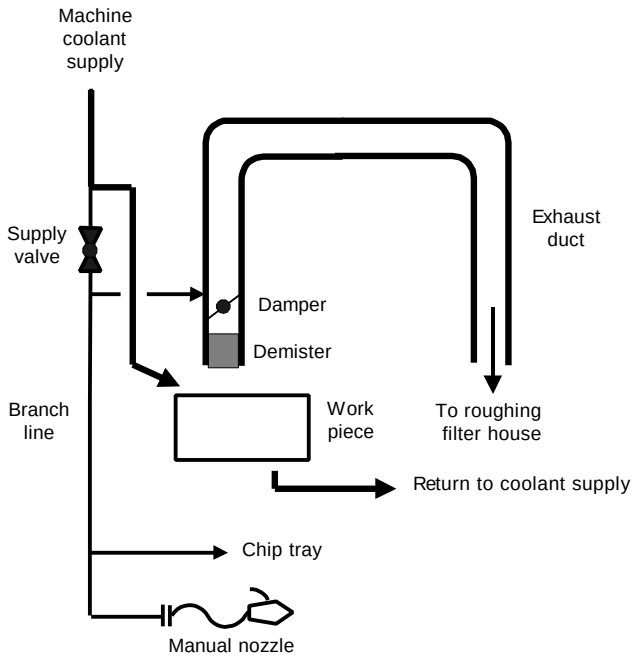


Figure 2-1. Configuration of Machine Coolant and Process Exhaust Systems

Investigators determined that the manual coolant supply valve was approximately half open and that the connection to the chip tray was completely clogged with crystallized borax. The connection to the exhaust duct presented the only open pathway for coolant loss, and investigators believe the atmospheric flow rate in the duct was high enough to transfer 120 gallons over a work shift. The machine operator told investigators that he might have bumped the valve handle. Investigators located the missing coolant on the floor of the roughing filter house, where negative pressure maintained by the process exhaust system prevented leakage past the access door. Facility engineers determined that the transfer of machine coolant to the roughing filter house did not compromise the criticality safety double-contingency principle. They also determined that neither the inadvertent transfer of coolant nor its return to the storage tanks constituted an unreviewed safety question. Short-term corrective actions included pumping the coolant back to the coolant storage tanks and increasing the frequency of surveillance of coolant storage tank level. Investigators reported that a recent change from coolant with a flammable component to water-based coolant has eliminated the need for connections to the machine room exhaust ducts. Long-term corrective actions include removing and blanking these connections.

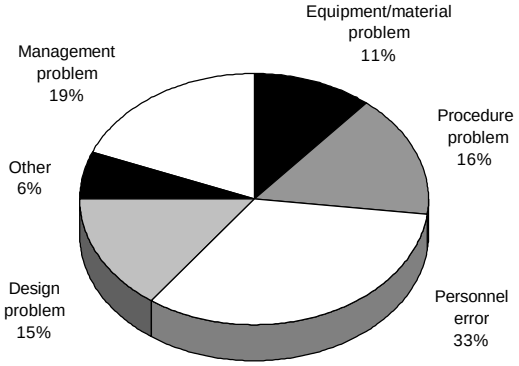
NFS reported inadvertent solution transfer events in several Weekly Summaries. Following are some examples.

- Weekly Summary 97-31 reported that an operator at the Savannah River Site incorrectly determined that a tank inlet valve was closed when it was actually open. This condition allowed acid to transfer to a tank that was supposed to be isolated. (ORPS Report SR--WSRC-HCAN-1997-0031)

- Weekly Summary 97-23 reported that operators at the Savannah River Site inadvertently transferred solution from the wrong cation concentrate batch tank to a precipitator feed tank. (ORPS Report SR--WSRC-FBLINE-1997-0019)

- Weekly Summary 96-14 reported that on March 28, 1996, operators at the Savannah River Site inadvertently transferred hydrofluoric acid. (ORPS Report SR--WSRC-FBLINE-1996-0016)

OEAF engineers reviewed the complete ORPS database for reports involving inadvertent transfers of solutions and selected 62 occurrences. Figure 2-2 shows the distribution of root causes reported by facility managers for these events. Personnel error represented 33 percent of the root causes, and management problems represented 19 percent. Inattention to detail accounted for 50 percent of the personnel errors, and inadequate administrative control accounted for 42 percent of the management problems.



Personnel Error	Percent
Inattention to detail	50
Procedure not used or used incorrectly	40
Other human	10

Management Problem	Percent
Inadequate administrative control	42
Work organization/planning deficient	25
Policy not adequately defined or enforced	8
Inadequate supervision	8
Other management problem	17

Figure 2-2. Distribution of Root Causes for Inadvertent Transfer of Solutions[1]

This event illustrates some of the problems that could develop when solutions are transferred inadvertently. Solutions containing fissile materials may be subject to inadvertent criticality, either by mixing or loss of geometry control. Reactions between incompatible chemicals may occur, resulting in explosive, corrosive, or gas-generating mixtures. Potential also exists for off-site release of radiation or hazardous chemicals. Facility managers should review Defense Programs Safety Information Letter SIL 95-05, *Inadvertent Transfer of Liquid Solution*, June 1995. This SIL addresses safety problems resulting from inadvertent transfers of solutions and includes recommendations for using procedures, verifying system lineups, holding detailed briefings, controlling tasks, and preparing contingency plans. A copy of SIL 95-05 can be obtained by contacting Tom Rotella, Defense Programs, Office of Engineering, Operations, Security, and Transition Support, at (301) 903-2649 or thomas.rotella@dp.doe.gov.
KEYWORDS: fissile material, operations, configuration control, transfer, criticality safety

FUNCTIONAL AREAS: Conduct of Operations, Configuration Control, Nuclear/Criticality Safety

[1] OEAF engineers searched the complete ORPS database using all narrative 'inadvertent AND transfer* AND (solution* OR liquid*)' and found 146 occurrence reports with 157 occurrences. A 100 percent review of these reports yielded 62 events.

3. INADEQUATE FIRE HAZARDS ANALYSIS

On August 3, 1998, at the Savannah River Site Hazardous Waste Storage Facility, Westinghouse personnel determined that the facility fire hazards analysis did not reflect the appropriate National Fire Protection Association (NFPA) building classification. They determined that, because the building was improperly classified, no one developed procedural controls addressing fork-truck usage in a facility bay where volatile flammable liquids, vapors, or gases are normally confined. Investigators determined that facility personnel have been operating fork trucks in this bay since approximately 1996. They also determined that the NFPA requirements changed in 1996 and that facility fork trucks used before 1996 were in compliance. Investigators determined that NFPA requirements and the facility safety analysis report designate that industrial trucks used in this area must have specific safeguards against inherent fire hazards. NFPA defines “industrial trucks” as fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines. (ORPS Report SR--WSRC-SLDHZD-1998-0007)

Investigators determined that in 1996 fire protection personnel incorrectly revised the fire hazards analysis and downgraded the facility from a class 1, division 2, facility to an unclassified facility. They determined that the facility bay contains chemicals such as toluene, gasoline, hexane, and diesel fuel, and NFPA requires facilities that contain these chemicals to be classified class 1, division 2. Investigators determined that NFPA also requires posting the entrance of the facilities to indicate the type of trucks permitted in the area and marking the trucks to designate their type.

The facility manager directed facility personnel to initiate the necessary procedure changes and implement a standing order to comply with the NFPA industrial truck requirements. He also directed facility personnel to ensure that industrial hygiene personnel monitor the lower explosive limits before performing fork-truck operations in any facility containing ignitable waste if the NFPA fork truck requirements can not be verified. He also directed facility personnel to implement the following corrective actions.

- Revise the fire hazard analysis to correct the building classification and include the proper fork-truck requirements.
- Install NFPA fork-truck postings for all facilities storing ignitable waste.
- Review other storage areas and determine whether the same problem could exist.
- Require fire protection engineers to review procedure changes and safety analysis report changes that have the potential to affect the fire protection program.
- Review the self-assessment program and ensure that it includes verifications that field conditions match those presented in the fire hazards analysis.

The facility manager also directed facility personnel to evaluate the availability and cost of properly rated fork trucks. He will continue to review this event and will develop additional corrective actions as necessary. In addition, DOE personnel requested a justification for interim operation to use a modified fork truck and have industrial hygiene sampling for lower explosive limits before performing any fork-truck operation in any facility containing ignitable waste. They also requested that the interim operation period be limited to 120 days to allow time to manufacture a properly rated fork truck. However, they stated that if a properly rated fork truck is not available after 120 days, waste handling operations that use fork trucks will be discontinued, and the waste will be moved to another location.

This event illustrates the importance of maintaining proper building classifications and implementing the associated requirements. In this event, facility personnel mis-classified the building which led to using improper industrial equipment. Misuse of industrial equipment can lead to fires that result in extensive facility damage. Industrial trucks should be evaluated for use based on the type of hazardous material stored within the proposed work area. NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance, and Operation*, designates the type of truck that can be used in hazardous areas. It also delineates requirements for refueling operations, truck fuel storage and handling, and appropriate maintenance and battery recharging areas. This event also illustrates the importance of thoroughly evaluating fire hazard analysis changes. In this event, a design basis fire that seriously compromised the health and safety of workers could have been initiated from a spark produced by the fork truck.

Facility managers and supervisors should consider implementing configuration management programs to ensure that the facility authorization basis adequately reflects the design basis. A configuration management program should provide personnel responsible for design changes with all information needed to adequately determine if proposed designs affect the authorization basis.

- DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*, chapter VIII, “Control of Equipment and System Status,” states that DOE facilities are required to establish administrative control programs to handle configuration changes resulting from maintenance, modifications, and testing activities.

- DOE-STD-1073-93, *Guide for Operational Configuration Management Program,* provides program criteria and implementation guidance for establishing consistency among design requirements, physical configuration, and facility documentation and for maintaining this consistency. This standard states that an effective configuration management program will increase the availability and retrievability of accurate information to support safe, sound, and timely decision-making related to facility design and operations.

KEYWORDS: unreviewed safety question, fire safety, hazard analysis, hazard categorization

FUNCTIONAL AREAS: Licensing/Compliance, Fire Protection, Configuration Control, Hazards and Barrier Analysis

4. CRITICALITY SAFETY INFRACTION AT LAWRENCE LIVERMORE

On August 7, 1998, at the Lawrence Livermore National Laboratory Plutonium Processing and Handling Facility, the facility manager reported that personnel discovered 268.32 grams of plutonium in a work-station, violating procedural mass limits. Investigators determined that a procedure had been in place that allowed facility personnel to store 2,500 grams of plutonium. They determined that the procedure expiration date had been extended several times. However, hazards control personnel decided not to extend it again because the procedure needed to be revised. Hazards control personnel notified the facility safety officer that the procedure would expire in 2 weeks and that the mass limit allowed for work-station storage would either need to comply with the facility safety procedure (220 grams of plutonium) or the operational safety procedure would need to be revised. However, facility personnel did not revise the operational safety procedure or move material out of the work-station after the procedure expired. Failure to follow procedures led to a mass limit violation. (ORPS Report SAN--LLNL-LLNL-1998-0047)

Investigators determined that this event is important because it indicates that corrective actions from several similar previous events were ineffective. Article 1 under Price-Anderson Amendments Act Information describes those events.

OEAF engineers will continue to follow this event and will provide additional information as it becomes available.

KEYWORDS: criticality safety, enforcement, Price-Anderson Act

FUNCTIONAL AREAS: Nuclear/Criticality Safety, Licensing/Compliance, Lessons Learned

PRICE-ANDERSON AMENDMENTS ACT (PAAA) INFORMATION

1. PRELIMINARY NOTICE OF VIOLATION FOR CRITICALITY SAFETY INFRACTIONS AT LAWRENCE LIVERMORE

On July 28, 1998, the DOE Office of Enforcement and Investigation issued a Preliminary Notice of Violation under the Price-Anderson Amendments Act to Lawrence Livermore National Laboratory for multiple and recurring failures to implement established quality assurance requirements with regard to a facility criticality safety program. Investigators determined that a series of criticality safety infractions occurred in a central repository used to process and store plutonium and fissionable uranium between May and December 1997. Although a criticality event did not occur as a result of these violations, investigators believe that the loss of positive control of fissile material over an extended period of time, coupled with numerous opportunities to identify and correct problems, is a significant safety concern. Investigators also determined that Laboratory managers did not identify the programmatic implications of these events and report them to DOE. Investigators concluded that Lawrence Livermore National Laboratory personnel failed to perform adequate oversight and assessments of criticality safety program compliance over a number of years. Investigators stated in the Notice that their investigation, combined with that of Lawrence Livermore investigators, established that a significant breakdown of quality assurance program requirements occurred. Investigators also stated in the Notice that the failure to implement improvements in the quality assurance program for oversight and assessment of operations could result in an additional enforcement action. (NTS-SAN--LLNL-LLNL-1997-0002)

Office of Enforcement and Investigation staff and DOE Oakland Operations Office personnel conducted an investigation of these events and proposed five Severity Level II violations for work control deficiencies that resulted in nuclear safety requirement violations. Severity Level II violations are significant violations that demonstrate a lack of attention or carelessness toward safety that could potentially lead to adverse impacts. Investigators determined that these deficiencies represent potential violations of 10 CFR 830.120, *Quality Assurance Rule*. The Notice describes (1) work control violations, (2) quality improvement violations, and (3) training and qualification violations.

WORK CONTROL VIOLATIONS

Investigators identified the following work control violations.

- From May 20 to July 15, 1997, certified plutonium handlers violated criticality safety procedures for mass limits and form controls 12 times, resulting in facility operations being shut down. In addition, a certified plutonium handler knew that a mass limit violation existed in a work-station on July 13, but waited 2 days before communicating the procedure violation to the appropriate personnel.

- In October 1997, plutonium movements resulted in several criticality safety violations: (1) plutonium storage vault mass limits for two containers were violated; (2) no one performed required reviews and approvals before the containers were stored in vaults; and (3) no one labeled the containers as required by procedures. Lawrence Livermore staff subsequently reviewed compliance with the vault storage requirements. They identified ten additional criticality hazard mass control infractions in seven separate vaults where no one performed or documented required criticality safety evaluations or approvals.

- In December 1997, Lawrence Livermore personnel violated criticality safety control containment requirements when they improperly removed fissile material from sealed metal containers and used only double plastic wrap for material containment before repackaging and shipping it.

QUALITY IMPROVEMENT VIOLATIONS

Investigators identified the following quality improvement violations.

- A supervisor performed a work area walk-through that was not effective in identifying and correcting procedural noncompliances.

- Facility personnel performed a criticality safety audit on October 21, 1996, but failed to identify any corrective action findings, despite a May 1996 criticality safety appraisal conducted by DOE Oakland Operations Office that identified significant problems with the facility criticality safety program.

- Between October 1997 and November 1997, facility personnel stored 12 items that exceeded mass limits for storage in vaults without obtaining a required review by criticality safety experts.

TRAINING AND QUALIFICATION VIOLATIONS

Investigators identified the following training and qualification violations.

- Two certified plutonium handlers and their supervisor did not understand criticality controls on two occasions, contributing to a combined total mass that exceeded procedural mass limits.

- Two certified plutonium handlers and their supervisor incorrectly assumed that they could rely on a computer-based fissionable material inventory tracking system to alert them of potential over-mass conditions. Therefore, they did not verify work-station conditions between May 20 and July 15, contributing to over-mass conditions in the work-station.

- An unqualified trainer incorrectly instructed two certified plutonium handlers during on-the-job training, and testing of these handlers did not comprehensively cover procedural controls.

Lawrence Livermore managers have 30 days to reply to the Preliminary Notice of Violation and admit or deny the alleged violations. The Preliminary Notice of Violation will become final if they admit the allegations and provide sufficient corrective actions within the 30-day period. Enforcement actions can be found at the Office of Enforcement and Investigation web site at URL http://tis-nt.eh.doe.gov/enforce/.

NFS has reported issuance of Notices of Violation and Preliminary Notices of Violations under the Price-Anderson Amendments Act in Weekly Summaries 98-26, 98-15, 98-11, 97-52, 97-41, 97-29, 97-12, 97-02, 97-01, 96-43, and 96-30.

Under the provisions of the Price-Anderson Amendments Act, DOE can fine for-profit contractors for violations of Department rules, regulations, and compliance orders relating to nuclear safety requirements. DOE contractors who operate nuclear facilities and fail to implement corrective actions for identified deficiencies could be subjected to Price-Anderson civil penalties under the work processes and quality improvement provisions of 10 CFR 830.120, *Quality Assurance Requirements*. These actions include Notices of Violation and, where appropriate, non-reimbursable civil penalties. DOE can also propose fines for non-profit contractors for violations of Department rules, regulations, and compliance orders relating to nuclear safety requirements. However, these fines can not be collected and are, therefore, designated as waived. In this case, the DOE Office of Enforcement and Investigation waived a proposed civil penalty of $153,750.00 ($28,125.00 for four Severity Level II violations and $41,250 for the Severity Level II violation that occurred in December 1997) because Lawrence Livermore National Laboratory is a non-profit contractor. They calculated the proposed civil penalty based on the severity of the events. They also determined that no penalty mitigation was warranted for prompt identification and reporting of the noncompliances because Lawrence Livermore personnel failed to identify these problems and, in some cases, failed to identify and report programmatic implications to DOE. Investigators did allow a partial mitigation of 25 percent of the base civil penalty ($205,000) for comprehensive corrective actions developed to support the resumption of facility operations.

The primary consideration for determining whether DOE takes enforcement action is the actual or potential safety significance of the violation, coupled with how quickly the contractor acts to identify and correct problems. The Office of Enforcement and Investigation may reduce penalties when a DOE contractor promptly identifies a violation, reports it to DOE, and undertakes timely corrective action. DOE has the discretion of not issuing a Notice of Violation in certain cases.

The Noncompliance Tracking System (Weekly Summaries 95-17 and 95-20) provides a means for contractors to promptly report potential noncompliances and take advantage of provisions in the enforcement policy. DOE STD-7501-95, *Development of DOE Lessons Learned Programs*, discusses management responsibility for incorporating appropriate corrective actions in a timely manner.

KEYWORDS: criticality safety, enforcement, Price-Anderson Act

FUNCTIONAL AREAS: Nuclear/Criticality Safety, Licensing/Compliance, Lessons Learned